WHAT IS CLAIMED IS:

1. A sliding-window transform with multi-stage integrated filtering comprising:

a first time delay configured to delay a digital sample by a time period corresponding to z^{-N} to produce a first delayed sample;

a second time delay configured to delay said first delayed sample by a time period corresponding to z^{-N} to produce a second delayed sample;

a combiner configured to combine said digital sample, said first delayed sample, and said second delayed sample according to a set of filter weights to produce a combined sample;

a multiplier configured to multiply said combined sample by a time-dependent complex value to produce a first complex sample;

a first filter configured to produce a first filtered output from said first complex sample; and

a second filter configured to produce a second filtered output from said first filtered output.

2. The sliding-window transform of Claim 1, wherein said first filter is an infinite impulse response filter.

3. The sliding-window transform of Claim 1, wherein said first filter is a single-pole filter.

4. The sliding-window transform of Claim 1, wherein said filter weights are real numbers.

5. The sliding-window transform of Claim 1, wherein said time-dependent complex value is $e^{-j\omega_i n}$.

6. A windowed sliding-window transform comprising:

a first filter portion implemented using real arithmetic to produce a plurality of first filtered samples;

a first complex mixer configured to apply a first time-dependent complex phase rotation to said plurality of first filtered samples to produce a first plurality of rotated samples; and

a second filter portion implemented using complex arithmetic to produce a plurality of output samples from said first plurality of rotated samples.

7. The windowed sliding-window transform of Claim 6, wherein said first filter portion comprises a plurality of *N*-sample time delays.

8. The windowed sliding-window transform of Claim 6, wherein said second filter portion comprises a plurality of single-sample time delays.

9. The windowed sliding-window transform of Claim 6, wherein said second filter portion comprises a plurality of infinite impulse response filters.

10. The windowed sliding-window transform of Claim 6, wherein said second filter portion comprises a plurality of single-pole filters applied in series.

11. The windowed sliding-window transform of Claim 6, wherein said first time–dependent complex phase rotation is given by $e^{-j\omega_i n}$.

12. The windowed sliding-window transform of Claim 6, wherein said first time-dependent complex phase rotation corresponds to a phase rotation of a bin in a DFT.

13. The windowed sliding-window transform of Claim 6, wherein said first filter portion produces a first filter transfer function according to a plurality of filter weights.

14. The windowed sliding-window transform of Claim 6, further comprising: a second complex mixer configured to apply a second time-dependent complex phase rotation to said plurality of first filtered samples to produce a second plurality of rotated samples; and a third filter portion implemented using complex arithmetic to produce a second plurality of output samples from said second plurality of rotated samples.

15. The windowed sliding-window transform of Claim 14, wherein said first time-dependent complex phase rotation corresponds to a phase rotation of a first bin in a DFT and said second time-dependent complex phase rotation corresponds to a phase rotation of a second bin in said DFT.

16. An apparatus, comprising:

means for filtering a plurality of real data samples according to a first filter transfer function to produce a plurality of first filtered samples;

means for applying a time-dependent complex phase rotation to said plurality of first filtered samples to produce a plurality of rotated samples; and

means for filtering said plurality of rotated samples according to a second filter transfer function to produce a plurality of output samples.

17. A method for processing a sliding-window transform, comprising:

delaying a plurality of digital samples by a first time period to produce a plurality of first delayed samples;

delaying said plurality of first delayed sample by a second time period to produce a plurality of second delayed samples;

combining said digital samples, said first delayed samples, and said second delayed samples according to one or more weight factors to produce a plurality of combined samples;

rotating said combined samples according to a first time-dependent phase rotation to produce a first plurality of rotated samples;

filtering said first plurality of rotated samples according to a first transfer function to produce a first plurality of filtered samples; and

filtering said first plurality of filtered samples according to a second transfer function to produce a first plurality of output samples.

18. The method of Claim 17, wherein said first time delay is an *N*-sample delay and said second time delay is an *N*-sample delay.

19. The method of Claim 17, wherein said first time-dependent phase rotation corresponds to a phase rotation of a first bin in a Type-2 DFT.

20. The method of Claim 17, wherein said first transfer function is a rectangular transfer function.

21. The method of Claim 17, wherein said second transfer function is a rectangular transfer function.

22. The method of Claim 17, wherein said first transfer function is a single-pole transfer function.

23. The method of Claim 17, wherein said one or more weight factors are expressed using real arithmetic.

24. The method of Claim 17, further comprising:

rotating said combined samples according to a second time-dependent phase rotation to produce a second plurality of rotated samples;

filtering said second plurality of rotated samples according to a third transfer function to produce a third plurality of filtered samples; and

filtering said third plurality of filtered samples according to a fourth transfer function to produce a second plurality of output samples.

25. The method of Claim 14, wherein said first transfer function, said second transfer function, said third transfer function, and said fourth transfer function are similar.

26. The method of Claim 14, wherein said first time-dependent phase rotation corresponds to a phase rotation of a first bin in a DFT, and said second time-dependent phase rotation corresponds to a phase rotation of a second bin in said DFT.